IN THE CLAIMS

Please amend the claims as follows:

Claims 1-34 (Canceled).

Claim 35 (Previously Presented): A projection-optical-system adjusting method with which to adjust a projection optical system used in an exposure apparatus, said adjusting method comprising:

obtaining information on a wave-front aberration of a projection optical system whose specification is determined with using one of a wave-front aberration amount and a value corresponding to a wave-front aberration as a standard; and

adjusting said projection optical system based on said obtained information on a wave-front aberration and Zernike Sensitivity corresponding to exposure conditions for an object.

Claim 36 (Original): A projection-optical-system adjusting method according to claim 35, wherein, in said adjusting, said projection optical system is adjusted such that the coefficient of a specific term selected, based on target information, from coefficients of terms of a Zernike polynomial in which a wave-front in said projection optical system is expanded is not over a given limit.

Claim 37 (Currently Amended): A projection-optical-system adjusting method according to claim 35, wherein, in said adjusting, said projection optical system is adjusted such that the RMS value of coefficients of terms of a Zernike polynomial in which [[said]] a wave-front within the entire field of said projection optical system is expanded is not over a given limit.

Claim 38 (Original): A projection-optical-system adjusting method according to claim 35, wherein, in said adjusting, said projection optical system is adjusted such that the coefficients of terms of a Zernike polynomial in which a wave-front in said projection optical system is expanded are not over given respective limits.

Claim 39 (Original): A projection-optical-system adjusting method according to claim 35, wherein, in said adjusting, said projection optical system is adjusted such that the RMS value, within the field of said projection optical system, of coefficients of n'th order, $m\theta$ terms corresponding to a watched, specific aberration out of coefficients of terms of a Zernike polynomial in which a wave-front in said projection optical system is expanded is not over a given limit.

Claim 40 (Currently Amended): A projection-optical-system adjusting method according to claim 35, wherein, in said adjusting, said projection optical system is adjusted such that the RMS value, within the field of said projection optical system, of coefficients of each group of $m\theta$ terms having the same $m\theta$ value out of terms, which correspond to a watched, specific aberration, out of terms of a Zernike polynomial in which a wave-front in said projection optical system is expanded is not over [[a]] each of given ~~respective limit~~ limits.

Claim 41 (Original): A projection-optical-system adjusting method according to claim 35, further comprising:

obtaining information of a pattern subject to projection in said projection optical system,

wherein, in said adjusting, said projection optical system is adjusted based on a space image of said pattern calculated based on linear combinations between sensitivities, to a watched aberration, of coefficients of terms of a Zernike polynomial in which a wave-front in said projection optical system is expanded and the coefficients of terms of a Zernike polynomial in which a wave-front measured in said projection optical system is expanded, such that said watched aberration is not over a limit, said sensitivities depending on said pattern.

Claim 42 (Previously Presented): A projection-optical-system adjusting method according to claim 35, further comprising:

obtaining target information that said exposure apparatus is to achieve,

wherein, in said adjusting, said projection optical system is adjusted such that the RMS value of coefficients given by weighting according to said target information the coefficients of terms of a Zernike polynomial in which a wave-front in said projection optical system is expanded is not over a given limit.

Claim 43 (Original): A projection-optical-system adjusting method according to claim 42, wherein said target information includes information of a pattern subject to projection by said projection optical system.

Claim 44 (Previously Presented): A projection-optical-system adjusting method according to claim 35, wherein in measuring said wave-front, a wave-front in said projection optical system is measured based on a result of printing a given pattern on a substrate via a pinhole and said projection optical system.

Claim 45 (Original): A projection-optical-system adjusting method according to claim 35, wherein in measuring said wave-front, a wave-front in said projection optical system is measured based on a space image formed via a pinhole and said projection optical system.

Claims 46-84 (Canceled).

Claim 85 (Previously Presented): A projection-optical-system adjusting method according to claim 35, wherein based on said obtained information on a wave-front aberration and said Zernike Sensitivity, adjustment information of said projection optical system is calculated using the least-squares method in order to adjust said projection optical system based on the adjustment information.

Claim 86 (Previously Presented): A projection-optical-system adjusting method according to claim 85, wherein based on data regarding a relation between an adjustment amount of an optical element of said projection optical system and variation of coefficients of terms of a Zernike polynomial, the adjustment amount of the optical element of said projection optical system is calculated as said adjustment information.

Claim 87 (Previously Presented): A projection-optical-system adjusting method according to claim 86, wherein

coefficients of terms of a Zernike polynomial are determined by measuring a wave-front aberration of said projection optical system, and

in calculation of said adjustment amount said determined coefficients of terms of a Zenike polynomial are used.

Claim 88 (Previously Presented): A projection-optical-system adjusting method according to claim 87, wherein an adjustment amount of said optical element is calculated such that an error of an image of a pattern is not over a given limit at each of a plurality of points in a predetermined area where the pattern is projected, within a field of said projection optical system.

Claim 89 (Currently Amended): A projection-optical-system adjusting method according to claim 88, wherein said exposure conditions ~~includes~~ include at least an illumination condition for a pattern to be transferred [[on]] onto said object.

Claim 90 (Previously Presented): A projection-optical-system adjusting method according to claim 35, wherein

said adjustment of said projection optical system is performed before said projection optical system is installed in said exposure apparatus, and

in said adjustment before the installation, at least one of reprocessing, replacement and position adjustment of an optical element of said projection optical system is performed.

Claim 91 (Previously Presented): A projection-optical-system adjusting method according to claim 35, wherein

measurement of information on said wave-front aberration and said adjustment of said projection optical system are performed after said projection optical system is installed in said exposure apparatus, and

in said adjustment after the installation, position adjustment of an optical element of said projection optical system is performed.

Claim 92 (Previously Presented): A projection-optical-system adjusting method according to claim 91, wherein

said adjustment of said projection optical system is performed before said projection optical system is installed in said exposure apparatus, and

in said adjustment before the installation, at least one of reprocessing, replacement and position adjustment of an optical element of said projection optical system is performed.

Claim 93 (Currently Amended): An exposure method with which to transfer a pattern onto an object via a projection optical system, said method comprising:

adjusting said projection optical system using the projection-optical-system adjusting method according to claim 91; and

forming an image of said pattern [[on]] <u>onto</u> said object via said adjusted projection optical system.

Claim 94 (Previously Presented): An exposure method according to claim 93, wherein based on said obtained information on a wave-front aberration and said Zernike Sensitivity, adjustment information of said projection optical system is calculated using the least-squares method in order to adjust said projection optical system based on the adjustment information.

Claim 95 (Previously Presented): An exposure method according to claim 94, wherein based on data regarding a relation between an adjustment amount of an optical element of said projection optical system and variation of coefficients of terms of a Zernike polynomial, the adjustment amount of the optical element of said projection optical system is calculated as said adjustment information.

Claim 96 (Currently Amended): An exposure apparatus that transfers a pattern onto an object, said exposure apparatus comprising:

a projection optical system which has a plurality of optical elements to form an image of said pattern [[on]] onto said object, and a specification of which is determined with using one of a wave-front aberration amount and a value corresponding to a wave-front aberration, as a standard; and

an adjusting unit which includes an actuator provided in said projection optical system, and adjusts said projection optical system based on information on a wave-front aberration of said projection optical system and Zernike Sensitivity corresponding to exposure conditions for said object.

Claim 97 (Previously Presented) An exposure apparatus according to claim 96, wherein said adjusting unit calculates adjustment information of said projection optical system using the least-squares method, based on said information on a wave-front aberration and said Zenike Sensitivity, and controls said actuator based on the adjustment information.

Claim 98 (Previously Presented): An exposure apparatus according to claim 97, wherein said adjusting unit calculates an adjustment amount of an optical element of said projection optical system as said adjustment information, based on data regarding a relation between the adjustment amount of the optical element of said projection optical system and variation of coefficients of terms of a Zernike polynomial.

Claim 99 (Currently Amended): An exposure apparatus according to claim 98, further comprising:

a measuring unit at least a part of which is disposed on a side of an image plane ~~with respect to~~ of said projection optical system in order to measure a wave-front aberration of said projection optical system; [[and]] wherein

said adjusting unit determines coefficients of terms of a Zernike polynomial from said measured wave-front aberration, and

in calculation of said adjustment amount, said determined coefficients of terms of a Zernike polynomial are used.

Claim 100 (Previously Presented): An exposure apparatus according to claim 99, wherein an adjustment amount of said optical element is calculated such that an error of an image of a pattern is not over a given limit at each of a plurality of points in a predetermined area where the pattern is projected, within a field of said projection optical system.

Claim 101 (Currently Amended): An exposure apparatus according to claim 100, wherein said exposure conditions ~~includes~~ include at least an illumination condition for a pattern to be transferred onto said object.

Claim 102 (Previously Presented): An exposure apparatus according to claim 96, wherein

a wave-front aberration of said projection optical system is measured before said projection optical system is installed in said exposure apparatus, and

based on the measured wave-front aberration, at least one of reprocessing, replacement and position adjustment of an optical element of said projection optical system is performed.

Claim 103 (New): An exposure method comprising:

determining an adjustment amount by an adjusting unit to substantially optimize an imaging state of a projection pattern, based on information on a wave-front aberration of a projection optical system whose specification is determined with using one of a wave-front aberration amount and a value corresponding to a wave-front aberration as a standard, Zernike Sensitivity corresponding to a pattern formed onto an object and forming conditions for the pattern, and data regarding a relation between an adjustment amount by said adjusting unit that adjusts an imaging state of said projection pattern generated onto said object via said projection optical system and a coefficient of a predetermined term of a Zernike polynomial; and

forming said pattern onto said object via said projection optical system under said forming conditions, using said determined adjustment amount.

Claim 104 (New): An exposure method according to claim 103, wherein

said forming conditions for said pattern include at least an illumination condition, and

in determination of said adjustment amount, the least-squares-method is used.

Claim 105 (New): An exposure method according to claim 104, wherein

in order to substantially optimize the imaging characteristic of said projection optical system under said forming conditions using said pattern, an optical element of said projection optical system is driven by said adjusting unit based on said determined adjustment amount.

Claim 106 (New): An exposure method according to claim 105, wherein

coefficients of terms of a Zernike polynomial are determined from a measurement value of a wave-front aberration of said projection optical system, and

in determination of said adjustment amount, the coefficients are used.

Claim 107 (New): An exposure method according to claim 106, wherein

said adjustment amount is determined such that an aberration of said projection optical system is substantially optimized at a plurality of points in a predetermined area where said projection pattern is generated, within a field of said projection optical system.

Claim 108 (New): An exposure method according to claim 107, wherein

said adjustment amount is determined such that both of a higher order component and a lower order component of an aberration of said projection optical system are substantially optimized.

Claim 109 (New): An exposure method according to claim 107, wherein

said adjustment amount is determined such that different aberrations and different order components of each aberration of said projection optical system are substantially optimized.

Claim 110 (New): A device manufacturing method comprising:

forming a device pattern onto a photosensitive object using an exposure method according to claim 103.

Claim 111 (New): An exposure apparatus comprising:

a projection optical system whose specification is determined with using one of a wave-front aberration amount and a value corresponding to a wave-front aberration as a standard;

an adjusting unit that adjusts an imaging state of a projection pattern generated onto an object via said projection optical system; and

a control system that determines an adjustment amount by said adjusting unit to substantially optimize an imaging state of said projection pattern, based on information on a wave-front aberration of said projection optical system, Zernike Sensitivity corresponding to a pattern formed onto an object and forming conditions for the pattern, and data regarding a relation between an adjustment amount by said adjusting unit and a coefficient of a predetermined term of a Zernike polynomial, wherein

in order to form said pattern onto said object via said projection optical system under said forming conditions, said determined adjustment amount is used.

Claim 112 (New): An exposure apparatus according to claim 111, wherein

said forming conditions for said pattern include at least an illumination condition, and

in determination of said adjustment amount, the least-squares-method is used.

Claim 113 (New): An exposure apparatus according to claim 112, wherein

said adjusting unit includes an actuator that drives an optical element of said projection optical system, and

said control system controls the driving of said optical element by said actuator based on said determined adjustment amount, in order to substantially optimize the imaging

characteristic of said projection optical system under said forming conditions using said pattern.

Claim 114 (New): An exposure apparatus according to claim 113, wherein

coefficients of terms of a Zernike polynomial are determined from a measurement value of a wave-front aberration of said projection optical system, and

in determination of said adjustment amount, the coefficients are used.

Claim 115 (New): An exposure apparatus according to claim 114, wherein

said adjustment amount is determined such that an aberration of said projection optical system is substantially optimized at a plurality of points in a predetermined area where said projection pattern is generated, within a field of said projection optical system.

Claim 116 (New): An exposure apparatus according to claim 115, wherein

said adjustment amount is determined such that both of a higher order component and a lower order component of an aberration of said projection optical system are substantially optimized.

Claim 117 (New): An exposure apparatus according to claim 115, wherein

said adjustment amount is determined such that different aberrations and different order components of each aberration of said projection optical system are substantially optimized.

Claim 118 (New): An exposure apparatus according to claim 114, further comprising:

a measuring unit at least a part of which is disposed on a side of an image plane of said projection optical system in order to measure a wave-front aberration of said projection optical system.

Claim 119 (New): A program that makes a computer for controlling an exposure apparatus execute a predetermined processing, said program making said computer execute a procedure of

determining an adjustment amount by an adjusting unit to substantially optimize an imaging state of a projection pattern, based on information on a wave-front aberration of a projection optical system whose specification is determined with using one of a wave-front aberration amount and a value corresponding to a wave-front aberration as a standard, Zernike Sensitivity corresponding to a pattern formed onto an object and forming conditions for the pattern, and data regarding a relation between an adjustment amount by said adjusting unit that adjusts an imaging state of said projection pattern generated onto said object via said projection optical system and a coefficient of a predetermined term of a Zernike polynomial, wherein

in order to form said pattern onto said object via said projection optical system under said forming conditions, said determined adjustment amount is used.

Claim 120 (New): A program according to claim 119, wherein

in order to substantially optimize an imaging state of said projection pattern, said program makes said computer for controlling execute a procedure of controlling said adjusting unit based on said determined adjustment amount.

Claim 121 (New): A program according to claim 120, wherein

said forming conditions for said pattern include at least an illumination condition, and

in determination of said adjustment amount, the least-squares-method is used.

Claim 122 (New): A program according to claim 121, wherein

in order to substantially optimize the imaging characteristic of said projection optical system under said forming conditions using said pattern, an optical element of said projection optical system is driven by said adjusting unit based on said determined adjustment amount.

Claim 123 (New): A program according to claim 122, wherein

coefficients of terms of a Zernike polynomial are determined from a measurement value of a wave-front aberration of said projection optical system, and

in determination of said adjustment amount, the coefficients are used.

Claim 124 (New): A program according to claim 123, wherein

said adjustment amount is determined such that an aberration of said projection optical system is substantially optimized at a plurality of points in a predetermined area where said projection pattern is generated, within a field of said projection optical system.

Claim 125 (New): A program according to claim 124, wherein

said adjustment amount is determined such that both of a higher order component and a lower order component of an aberration of said projection optical system are substantially optimized.

Claim 126 (New): A program according to claim 124, wherein

said adjustment amount is determined such that different aberrations and different order components of each aberration of said projection optical system are substantially optimized.

Claim 127 (New): A storage medium in which a program according to claim 119 is recorded that can be read by a computer.